

SUBCOMMITTEE ON SPACE AND AERONAUTICS
COMMITTEE ON SCIENCE
U. S. HOUSE OF REPRESENTATIVES

HEARING CHARTER

Future Markets for Commercial Space

April 20, 2005
9:30 a.m. to 12:00 noon
2318 Rayburn House Office Building

Purpose:

On Wednesday, April 20, at 9:30 a.m., the Subcommittee on Space and Aeronautics will hold a hearing to examine the future of the commercial space market and the government's role in that future. Last year, the President signed into law the Science Committee's Commercial Space Launch Amendments Act, which dealt with regulating one aspect of commercial space – private, human suborbital flights, which are generally intended for space tourism.

The first panel at the hearing will examine the potential for space tourism, with a focus on last year's successful flights by SpaceShipOne, the world's first privately-built and human-piloted spacecraft.

Built by famed aircraft developer Burt Rutan, SpaceShipOne last year won the Ansari X Prize, a \$10 million kitty raised by space enthusiasts to stimulate entrepreneurial interest in space flight. Rutan's ship was the first to fly to an altitude of more than 100 kilometers twice in two weeks, beating 25 other teams from seven countries.

Virgin Galactic, founded by the Virgin entertainment and airline company owner Richard Branson, has announced plans to buy a fleet of spacecraft based on SpaceShipOne's design to carry tourists into suborbital space (an altitude not sufficient to orbit the Earth), possibly as early as 2008.

The second panel will examine the potential of the wider commercial space market, which includes rockets to launch satellites and the satellites themselves, which provide services ranging from beaming images of landscapes and weather patterns, to global communications and entertainment. The commercial space market has had a spotty record of success. The government is very involved in the commercial space market in a variety of ways, including providing permits for launches and insuring private parties against catastrophic accidents. Perhaps most significantly, the government is a leading purchaser of both satellites and launch services.

Another potential aspect of the commercial market – private provision of services for the National Aeronautics and Space Administration (NASA) to service the International Space Station – will not be a focus of this hearing.

Witnesses:

FIRST PANEL:

Mr. Burt Rutan founded his company Scaled Composites, Inc. in 1982. For SpaceShipOne's achievements, Mr. Rutan this month received the Collier Aerospace Trophy, the most prestigious prize in aeronautics.

Mr. Will Whitehorn is the President of Virgin Galactic and Group Corporate Affairs and Brand Development Director for Virgin Management Limited.

SECOND PANEL:

Mr. Elon Musk is the CEO and Chief Technology Officer of Space Exploration Technologies (SpaceX) in El Segundo, CA. He formerly founded two Internet companies, PayPal and Zip2 Corporation.

Mr. John W. Vinter is Chairman of the International Space Brokers (ISB). ISB represents nine of the twenty satellite companies in the world and is the only insurance broker that is focused exclusively on the space industry.

Mr. Wolfgang Demish, the founder of Demisch Associates, LLC, is an aerospace financial analyst.

Dr. Molly Macauley is a Senior Fellow and Director of Academic Programs at the Resources For the Future.

Overarching Questions:

The Committee will focus on the following questions at the hearing:

1. What is the outlook for the various aspects of the commercial space industry over the next five to ten years?
2. What should the government do or not do to encourage the nascent commercial space industry?
3. How can the commercial space industry avoid some of the pitfalls that have led to unrealized expectations in the past?

Background:

The Rise of Commercial Space Industry and the Role of Legislation

From the dawn of the space age through much of the 1980s, governments dominated efforts in space. Governments financed and owned most satellites, which were launched on government-owned vehicles, including the Space Shuttle.

The Challenger accident in 1986, however, helped spur private sector ownership of both satellites and launch vehicles. After the Challenger accident, for example, government agencies, particularly the Department of Defense, viewed the Space Shuttle as too risky to be the sole launch vehicle for U.S. government payloads and began looking for alternatives.

The Science Committee passed the Commercial Space Launch Act (CSLA) of 1988, which required NASA to purchase launch services for satellites from private companies rather than purchasing the launch vehicle itself. The CSLA ensured a market for the nascent launch industry by requiring the government to be a customer.

The CSLA also provided another element intended to foster the success of the new industry – indemnification against catastrophic accidents. Because a single launch failure had the potential of causing billions of dollars of damage should the debris fall on populated areas, the private sector argued that no private insurance company would offer coverage to a satellite company or launch provider unless the government agreed to indemnify (that is, pay for) at least a portion of the potential damages.

The CSLA indemnifies companies for catastrophic losses – losses above the amount of damages that private insurers calculate to be the maximum probable loss (for which private insurers themselves provide coverage) to a ceiling of \$1.5 billion. While there is debate over whether indemnification is necessary as the satellite launch industry matures, Congress last year, led by the Science Committee, extended the indemnification provisions of the CSLA through December 31, 2009.

The CSLA also established a permitting process within the Office of Commercial Space Transportation (known as AST), now housed within the Federal Aviation Administration (FAA), for all private commercial launches.

Last year, as SpaceShipOne became the first privately funded, developed, and operated spacecraft to carry a person into suborbital space, the Science Committee passed legislation designed to foster a commercial space tourism industry. The Commercial Space Launch Act Amendments of 2004 gave AST explicit authority to permit launches with humans on board and provided guidance on how to use that authority. One key provision created a new kind of permit that would facilitate flights by experimental

vehicles, modeled on the regime another part of FAA uses to regulate airplanes. (That part of FAA is known as AVR.) Another key provision limited the extent to which AST could regulate passenger safety in the near term. (A summary of the Act is attached.)

The Challenges Faced by Commercial Space Industries

Commercial space industries today include communication satellite developers (including radio, television, and telecommunications), launch service providers (whose customers include the government), satellite imagery companies, and perhaps soon, space tourism companies like Virgin Galactic and companies servicing the International Space Station.

One of the first challenges these companies face is securing financing. Space assets are expensive, and launching into space is fraught with risk. One or two launch failures can drive a company into bankruptcy. Finding investors is thus very difficult for new entrants in the space business, who frequently must court risk-seeking, “angel investors” rather than relying on more established financing firms.

Space industries must also secure insurance. But there are limits to the private pool of insurance available, which can pose a challenge to newcomers to the space business, who necessarily lack a track record to demonstrate their reliability to insurers. Moreover, costly failures in one portion of the space industry can affect the availability of insurance for the rest.

Perhaps the greatest challenge commercial space industries face is capturing a market large enough to sustain them. Unfortunately, their history of success in doing so has been spotty. The commercial satellite imagery or remote sensing industry has failed to develop as originally expected. But satellite radio seems to be gaining in popularity despite the abundance of free competition on more traditional airwaves.

Still, markets can be elusive. For example, optimism for communications satellite manufacturers ran high in the 1990s when markets opened in China and the former Soviet states, where there was little permanent communications infrastructure. Three U.S. companies raced to take advantage of the seemingly boundless opportunities. Iridium, a Motorola spinoff based in Chicago, was the first company in the race. It launched 66 communications satellites into orbit. Next was Globalstar, which had planned to launch 48 satellites.

But the ground-based cell phone industry was quicker. Its penetration into the former Soviet and Chinese markets soon rendered Iridium’s and Globalstar’s investments practically useless. Iridium’s assets were ultimately sold to a group of private investors, which continue to own and operate Iridium today. (The Department of Defense continued to use Iridium throughout the change in ownership.) A third company, Teladesic, had planned to launch 288 satellites, but could not attract enough investors after the failure of Iridium and Globalstar.

As satellite producers saw their fortunes fade so did those companies who had hoped to put those satellites into orbit. Lockheed Martin and McDonnell Douglas had earlier invested large sums, aided by the government, to develop a new generation of launch vehicles. Boeing launches Sea Launch and the Delta series of rockets (obtained when Boeing took over McDonnell Douglas), and Lockheed launches the Atlas series of rockets. The Europeans have a competing Ariane rocket.

Unlike the Space Shuttle, these rockets are used only once, so they are known as Expendable Launch Vehicles (ELVs). The most advanced of the Atlas and Delta class vehicles, developed with the U.S. Air Force, are known as Evolved Expendable Launch Vehicles (EELVs). Elon Musk is developing a series of rockets dubbed Falcon, which he believes will launch at a significantly lower cost.

With the decline of the satellite industry, the rocket manufacturers were left with too few customers to easily recoup their costs. That has raised the cost of launches to the government. The recently released White House Space Transportation Policy is designed to find a way to provide enough business to keep two competing U.S. entities in the launch market. NASA's pending decisions on how to launch its scientific satellites and on how to launch the planned Crew Exploration Vehicle would affect the market.

SpaceShipOne

Burt Rutan's SpaceShipOne is an effort to open a new aspect of the commercial space market – space tourism. Rutan had to complete two consecutive successful flights to earn the X-Prize. Those flights were not trouble-free. The vehicle rolled 29 times during the first flight; the vehicle shook but had only a “little roll” during the second flight, according to the pilot. No one was injured in either case.

Questions Asked of the Witnesses:

In their letters of invitation, the witnesses were asked to address the following questions in their testimony:

Mr. Burt Rutan:

1. What is the future of your commercial SpaceShipOne program and do you see other customers beyond Virgin Galactic?
2. What should the government do or not do to encourage commercial space endeavors?
3. If you develop other vehicles, where would you expect to find investors? Do you think the traditional investors of Wall Street are likely to step forward?
4. As you move into the commercial world, how do you expect to be able to get insurance coverage?

Mr. Will Whitehorn:

1. When does Virgin Galactic plan to take ownership of the five SpaceShipTwos that it has ordered from Scaled Composites? How soon do you expect to be flying? When do you expect to make a profit?
2. What is different in preparing to take ownership of a fleet of spaceships vs. Virgin Atlantic taking ownership of a fleet of airplanes?
3. What preparation are you engaged in for the commercial use of these vehicles?
4. What, if anything, should the government be doing or not doing to encourage commercial space?

Mr. Elon Musk:

1. What business plan do you have to make your launch vehicle a success in the commercial market?
2. What do you see as the outlook for commercial space activities in the next five years? The next ten years?
3. What, if anything, should the government do or not do to encourage the nascent commercial space industry?
4. Are there implications for the commercial space industry as you see it in the President's announced Vision for Space Exploration?

Mr. John H. Vinter:

1. What kind of activities does your company include for insurance purposes in its definition of "commercial space?"
2. As insurance brokers, what do you see as the outlook for commercial space activities in the next five years? The next ten years? How do you think we can avoid exaggerated expectations for the industry, such as those that occurred in the low earth orbit (LEO) market in the late 1990s?
3. What, if anything, should the government do or not do to encourage commercial space endeavors?

Mr. Wolfgang Demisch:

1. Considering some of the difficulties in the past for commercial space business, (the low earth orbit launches anticipated for Iridium, Teledesic, etc.) and the slow growth of the commercial remote sensing industry, what is your outlook for this nascent commercial space launch business and how do we avoid the failures of the past?
2. In the entrepreneurial commercial space arena, when would you expect traditional Wall Street investors to become classic "risk-reward" investors, in place of the "angel" investors that we see today?
3. What, if anything, should the government do or not do to encourage commercial space endeavors?

Dr. Molly Macauley:

1. What kinds of activities would you include in "commercial space?"
2. Is the U.S. the leader in "commercial space?" How does it compare with the status of international commercial space?

3. What do you think the government should do or not do to encourage commercial space?
4. What do you see as the outlook for commercial space activities in the next five years? The next ten years?

APPENDIX – COMMERCIAL SPACE LAUNCH ACT AMENDMENTS OF 2004

Commercial Space Launch Amendments Act of 2004

H.R. 5382, the Commercial Space Launch Amendments Act of 2004, is designed to promote the development of the emerging commercial human space flight industry by putting in place a clear, balanced regulatory regime.

The Act assigns to the Secretary of Transportation jurisdiction over commercial human space flight and requires the Secretary to craft a streamlined experimental certification process for suborbital reusable launch vehicles. The Secretary of Transportation must ensure that only one license or permit is required to conduct human space flights. By its licensing or permitting of flights, the United States does not certify the safety of the flights for passengers or crew.

The Act requires the Secretary of Transportation to protect the uninvolved public when licensing commercial human space flights. The Act also requires that crew receive training and satisfy medical standards. Space flight participants must undergo appropriate medical exams and training requirements, and must provide written informed consent for their participation. For the first eight years after enactment of the legislation, the Secretary of Transportation may issue regulations governing the design or operation of a launch vehicle only if the design or operation has indicated likely safety problems through operational experience.

The Act extends the existing liability indemnification regime to the commercial human space flight industry, but excludes launches under an experimental permit.

SUMMARY OF H.R. 5382

The Commercial Space Launch Amendments Act of 2004

Introduced by Mr. Rohrabacher (CA) and co-sponsored by Mr. Boehlert (NY), Mr. Hall (TX), Mr. Gordon (TN) and Mr. Lampson (TX)

Key features of the Act include:

- The Act will make it easier to launch new types of reusable suborbital rockets by allowing the Secretary of Transportation to issue experimental permits that can be granted more quickly and with fewer requirements than licenses;

- Under the Act, permits will allow an unlimited number of experimental flights, rather than requiring a license for a single launch or small number of launches;
- The Secretary of Transportation must ensure that only one license or permit is required to conduct human space flights;
- The Act will require the Secretary of Transportation to issue regulations for crews relating to training and medical condition;
- The Act will limit requirements for paying passengers (or “space flight participants”) a medical exam, training, and to being informed of the risks of their participation and providing written, informed consent;
- By its licensing or permitting of flights, the United States does not certify the safety of the flights for passengers or crew;
- For the first eight years after enactment of the legislation, the Secretary of Transportation may only issue regulations governing the design or operation of a launch vehicle if the design or operation has indicated likely safety problems through operational experience.
- The Act will require paying passengers to execute waivers of liability with the federal government; and
- The Act will extend the existing liability indemnification regime to commercial human space flight launches, but the bill will not grant indemnification for flights conducted under experimental permits, which will be more lightly regulated.